Physiotherapeutic Assessment in Oncological Post-Mastectomy Patients

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ABSTRACT
Introduction: Breast cancer is one of the most prevalent forms of cancer among women, and the medical treatment protocols are highly aggressive. In the case of mastectomy, a number of different sequelae are generated, including pain, functional limitation of the shoulder, dehiscence of the wound, decrease in joint range, decrease in muscle strength, lymphedema, and so forth. Such consequences directly impact the functionality and quality of life of the individual. Physiotherapy represents a potential avenue for addressing the sequelae resulting from the surgical procedure. Objective: The objective is to conduct a bibliographic research on the early physiotherapeutic treatment of post-mastectomy cancer patients. Methodology: A search for clinical trials from 2016 to 2023 was conducted in multiple languages, including English, Portuguese, and Spanish, across several databases: PEDro, PubMed, ScienceDirect, Cochrane, and Google Scholar. The inclusion and exclusion criteria facilitated an appropriate selection process for clinical trials, in conjunction with the PRISMA method. The selected clinical trials included a total sample of 644 individuals, in which various physiotherapeutic modalities were evaluated for the purpose of combating the various sequelae generated by mastectomy. Conclusions: Physiotherapy offers a range of beneficial therapeutic modalities, which, when applied early in post-mastectomy cancer patients, have a positive impact on these individuals. These include therapeutic exercise, hydrotherapy, and resistance aerobic exercise. Conversely, there are modalities such as manual lymphatic drainage and extracorporeal shock wave therapy that have uncertain benefits, given the lack of consensus on their evidence base.

1. Introduction

Breast cancer represents the most prevalent group of three cancers worldwide. It is more prevalent in females, although it can also manifest in males. Advanced stages of the disease are life-threatening, and the likelihood of this outcome increases if an early diagnosis is not made (1). Mastectomy is a surgical procedure in which the tumor mass is excised. His approach has undergone a process of evolution, progressing from radical techniques to more conservative ones. Nevertheless, the consequences of mastectomy have a detrimental impact on the individual, affecting various aspects of their biopsychosocial structure, functionality, activity, and participation (2) (3). Timely intervention with physiotherapy is beneficial for cancer patients at each stage of the disease and during medical treatments. Its efficacy in mitigating the most prevalent sequelae has been substantiated (3) (4). Cancer is one of the most prevalent and lethal diseases globally, with an increasing incidence rate, underscoring the need for a greater number of specialized professionals in this field. Physiotherapy represents a viable option for improving quality of life. A study conducted by the American Cancer Society revealed that one in eight women in the United States will develop breast cancer over the course of their lifetime. Furthermore, it is estimated that by 2050, the global incidence of female breast cancer will reach approximately 3.2 million new cases per year. These data reflect a significant public health issue, its impact on society, and the urgent need for specialists, preventive measures, and treatment (5). The results of various studies on oncological physiotherapy indicate that its implementation is advantageous before, during, and after breast cancer therapy. Consequently, further research is required to examine the variables of shoulder biomechanics and functionality, functional capacity, cardiorespiratory function, and painful sensitivity to pressure through a physiotherapy program in the short and long term after surgery (6).

Anatomy of the breast

The breasts are two structures that represent a sexual characteristic of the female sex. The mammary secretory glands form the breasts, which are located on the anterior wall of each hemithorax. They are situated between the third and seventh rib and between the lateral line of the sternum and the anterior axillary line (7) (8) (9) (10).

Breast physiology

The changes that initiate the process of breast development in women commence at the onset of puberty, coinciding with the initiation of the menstrual cycle and the subsequent alterations in hormonal levels, particularly those of estrogen and progesterone. The developmental process is only completed during pregnancy and lactation.

The breast in young women is primarily composed of adipose tissue, with additional components including fibro glandular parenchyma and connective tissue. The breast is composed of approximately 15 to 20 glandular lobes, each of which contains 10 to 100 hollow alveoli, measuring a few millimeters in size. Ultimately, the lobes drain into the milk ducts, which then lead to the lactiferous breast, ultimately ending in the nipple-areola complex (7) (8) (11).

Breast cancer

It is a type of cancer that originates in the breast and is characterized by the accelerated and uncontrolled growth of cells of the breast glandular tissue. It is the most prevalent form of cancer globally, manifesting in both sexes. However, it is more frequently observed in women, accounting for 99% of cases (12) (13) (14).

Mastectomy

The surgical procedure entails the excision of the breast, with the objective of eradicating all malignant tissue. In many cases, the surgical procedure also involves the removal of tissues in close proximity to the breast, due to the assumption of metastasis to other structures via the vessels. A mastectomy does not entirely eliminate the risk of cancer in other structures, as the probability of this occurring is only partially reduced at the site of the surgical procedure (15) (16) (17).

Role of the physiotherapist in the treatment of breast cancer

The physiotherapist's role in the pre-rehabilitation phase is to gain comprehensive knowledge of the diagnostic process and, subsequently, to establish the initial contact with the individual, thereby facilitating the formation of a therapeutic alliance that optimizes physical and emotional recovery. In this phase, the objective for the patient is to undergo an evaluation that enables them to ascertain their overall functional capacity and identify potential risk factors and current or future deficiencies associated with cancer therapy.

The ability to perform activities of daily living (ADLs) is contingent upon functional capacity. This is contingent upon and constrained by the quality of life of each individual. It is essential that the physiotherapist adopt a comprehensive approach to the disease, incorporating validated questionnaires into the evaluation process to ascertain the quality of life and any other emotional limitations that require immediate attention. Upon overcoming breast cancer, the individual then enters a process of survival. In this phase, the physiotherapist performs assessments and provides education and training to the patient, with the objective of maintaining and enhancing their functional capacity (19) (20) (21) (22) (23).

Post-mastectomy oncological physiotherapy

Medical history: This tool enables the acquisition of comprehensive information, facilitating a deeper understanding of the patient's condition and enabling health personnel to make more informed decisions. It constitutes an indispensable element, providing the foundation for diagnosis and forming the initial stage prior to conducting a physical examination (7) (24).

Pain assessment: In 2015, Ebid, AA, and El-Sodany conducted a study in which they employed the Visual Analogue Scale (VAS) for the assessment of pain. They concluded that the VAS is a reliable, effective, and valid tool for assessing pain intensity (23, 25).

Joint evaluation: The assessment of joint range of motion (ADM) or range of motion (ROM) is of paramount importance, as the movements of the shoulder joint complex are significantly impaired. The utilization of goniometers enables the objective assessment of the ADM or ROM of the upper limb that has undergone surgery, as well as the contralateral limb, for comparative purposes. Similarly, the assessment of ADM or ROM is linked to an individual's ability to perform activities of daily living. In order to assess functionality, questionnaires or scales may be employed, including the Upper Limb

Disability Questionnaire (DASH) and the Constant Shoulder Score.

Muscle evaluation: In 2017, De Groef, A. et al. conducted a randomized controlled trial to assess the efficacy of myofascial techniques for the treatment of upper limb dysfunctions in breast cancer survivors. The muscle strength of all participants was evaluated with a dynamometer (23) (25).

Vascular evaluation: This evaluation is concerned with the presence of lymphedema resulting from surgical procedures and cancer therapy. In order to evaluate and diagnose lymphedema, it is necessary to perform volumetric measurements of the affected limb using water displacement technology and to take anthropometric measurements of the circumference of the affected arm. In addition to these methods, more sophisticated and objective techniques such as bioimpedance analysis and infrared fluoroscopy may be employed (25).

Evaluation of the skin and adnexa: This evaluation is closely related to lymphedema, as the superficial lymphatic system originates from a depth of 1 mm beneath the skin. Therefore, its care is of paramount importance to prevent the reduction in tissue elasticity, hardening, and fibrosis. An evaluation by observation and palpation is essential for the timely identification of skin wounds and infections, as these can negatively impact the efficacy of treatment and the desired outcome (26).

Early post-mastectomy physiotherapy treatment modalities

Early hospital and outpatient period

Physiotherapy intervenes in order to avoid circulatory disorders, respiratory complications and edema caused by surgery.

Kinesiotherapy: It is recommended that patients perform passive and active exercises at the level of the shoulder joint complex from the first postoperative day onwards. This is to maintain mobility, improve circulation, posture and functionality of the affected limb, since the marked establishment of post-mastectomy sequelae, such as lymphedema, can be prevented (27) (28).

- **Proprioceptive neuromuscular facilitation (PNF):** It represents a viable alternative for the implementation of post-mastectomy exercise, including in cases where brachial plexus damage is present (29).
- **Muscle strengthening:** The advancement of muscle strengthening should be gradual, commencing with isometric exercises, which are the most recommended to initiate during this initial hospital period. These exercises should be concentrated on the muscles of the forearm, hand, and contralateral upper limb. The objective is to influence the functionality of the affected upper limb (6) (23) (27).
- **Skin care:** Individuals who have undergone a mastectomy, and even more so those who have also had lymph node removal, are at risk of developing stage 0 lymphedema despite the absence of clinical signs. It is of the utmost importance to prioritize skin and nail care, as they serve as the foundation for the subsequent implementation of intricate decongestive therapy, which is essential for the prevention of lymphedema. It is recommended that the skin be kept well hydrated through the consumption of abundant amounts of water and exposure to indirect light, which allows for the synthesis of vitamin D. In order to prevent infections and irritations, it is advisable to utilize low-pH creams and soaps, avoiding those that are petrolized or exfoliating in nature (23).
- **Bandages:** the use of low-pressure preventive or antithrombotic sleeves. These have a standard measurement of about 15 to 20 mmHg and should be recommended and supervised by qualified health personnel (26).

2. Methodology

The research is a bibliographic review, as the data and information were collected through the appropriate handling of texts, writings, books, and journals from various bibliographic sources, including scientific articles, particularly clinical trials. The present research is both descriptive and explanatory-analytical in nature. The research is descriptive, as it provides a comprehensive account of the salient characteristics, properties, and features of early physiotherapy in post-mastectomy patients. This was achieved through a meticulous search and review of information sourced from

diverse bibliographic sources.
It is explanatory-analytical in nature, elucidating the underlying reasons behind the impact of oncological physiotherapy, encompassing its diverse modalities, on individuals undergoing mastectomy. This approach allows for a more comprehensive and effective examination of the issue at hand.
The search strategy employed in this bibliographic research was devised in accordance with the formulation of the problem and the objectives of the work. To proceed with the search for information in the different databases, the search for keywords was initially carried out using the Descriptors in Health Sciences (DeCS), in English, Portuguese, and Spanish. The search for information was conducted using the selected keywords in the following databases: The databases consulted were PEDro, PubMed, ScienceDirect, Cochrane, and Google Scholar. Moreover, the keywords were combined using various connectors, such as "AND" and "OR," to conduct a targeted search for the topic in accordance with the established objectives.

Inclusion criteria

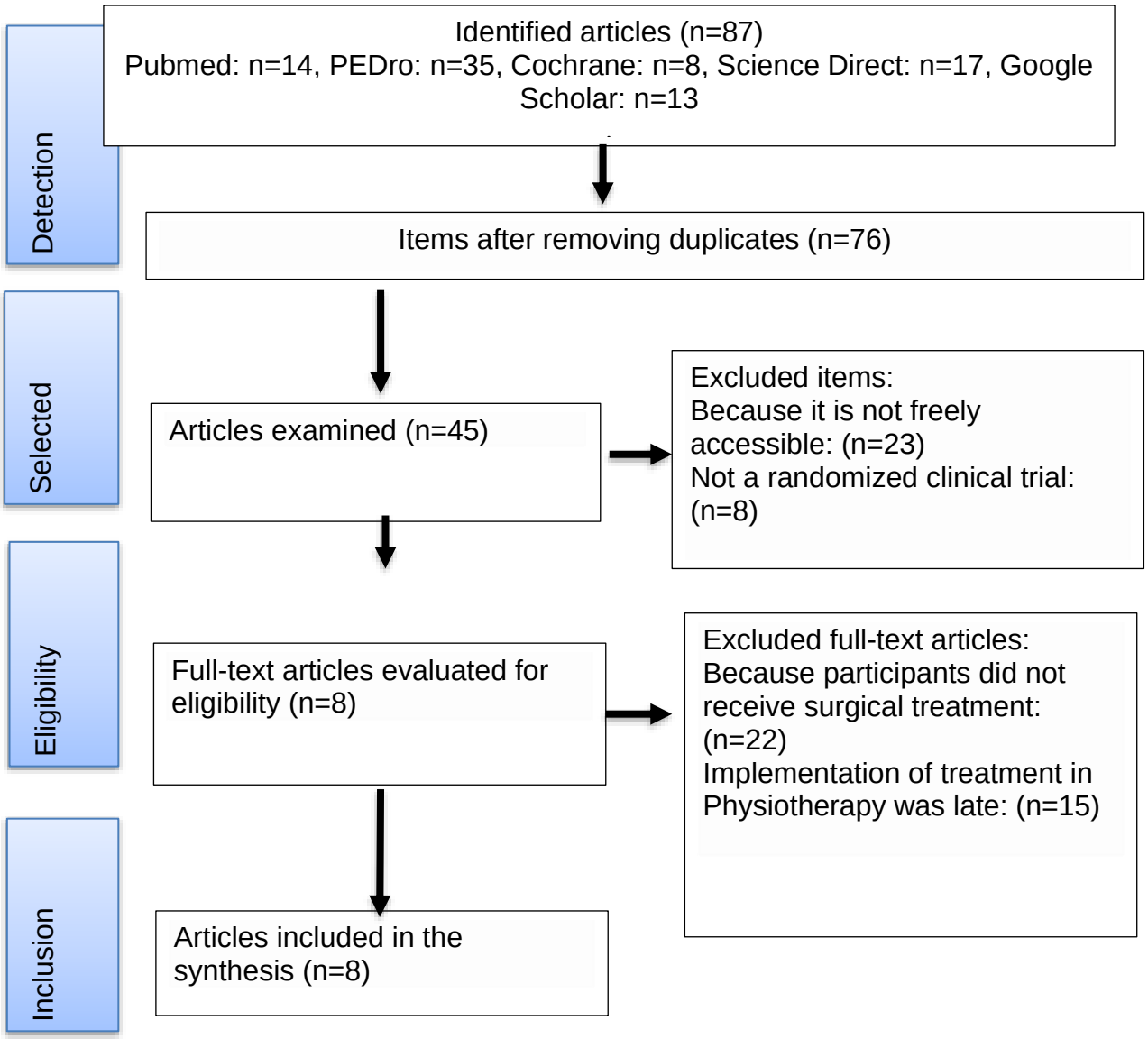
- Clinical trials published between 2016 and 2023.
- Clinical trials free of charge.
- Clinical trials from the PEDro database and PubMed.
- Clinical trials with a rating equal to or greater than 5 on the PEDro scale.
- Clinical trials in which participants have undergone mastectomy surgery.
- Clinical trials showing a relationship between physiotherapy programs and the evolution of breast cancer.
- Clinical trials comparing the effects of physiotherapy on the most common post-mastectomy sequelae
- Clinical trials showing the efficacy of physiotherapy programs in the area of oncology, particularly in breast cancer

Exclusion Criteria

- Clinical trials less than 2016.
- Clinical trials with a cost to download them from the database.
- Clinical trials that do not link physical therapy modalities as a treatment option for breast cancer.
- Clinical trials in which the population was not surgically operated on by mastectomy.
- Clinical trials in which the population has undergone physiotherapy in a time greater than or equal to one year after oncological surgical treatment.

A review of the literature was conducted to identify articles pertaining to the subject of early therapeutic modalities in post-mastectomy cancer patients, at both the hospital and early outpatient levels. The abstracts, methodologies, and results presented by these articles will be taken into account to create a summary in tables, dividing the information into categories such as author and date, objectives, sample size, intervention, results, and others. The PRISMA strategy was employed for the assessment of the articles and their organization into a systematic format.

In the initial search, 87 articles were identified across the following databases: PubMed (16), PEDro (35), Cochrane (8), ScienceDirect (17), and Google Scholar (13). Eight articles were excluded on the grounds that they were not clinical trials, while a further 36 were excluded due to the cost of accessing the full text. Furthermore, an additional 22 articles were excluded on the grounds that the participants had not undergone surgical treatment (mastectomy). Subsequently, a further 15 articles were excluded from the study on the grounds that the implementation of physiotherapy programmes was delayed. Ultimately, eight studies were selected for analysis based on the established inclusion criteria. The results of the literature review are detailed in Graph 1, which presents the findings of studies published between 2018 and 2023.
Figure 1. *Flowchart with the selected articles following the format of the PRISMA declaration*


Detection
Identified articles (n=87)
Pubmed: n=14, PEDro: n=35, Cochrane: n=8, Science Direct: n=17, Google Scholar: n=13
Items after removing duplicates (n=76)
Selected
Articles examined (n=45)
Excluded items:
Because it is not freely accessible: (n=23)
Not a randomized clinical trial: (n=8)
Eligibility
Full-text articles evaluated for eligibility (n=8)
Excluded full-text articles:
Because participants did not receive surgical treatment: (n=22)
Implementation of treatment in Physiotherapy was late: (n=15)
Inclusion
Articles included in the synthesis (n=8)

3. Results And Discussion

Author	Year	Population/Age	Groups	Intervention	Objective	Results
Devoogdt N, et al.	2018	n=160. Women between 50-56 years old	2 groups. Both received 6 months of intervention, 40 sessions of 30 minutes each. A follow-up up to 5 years later. Experimental group n=79. Control group n=81	Patients were enrolled in the study after receiving axillary dissection for breast cancer. Both groups performed therapy and exercise, with the experimental group also receiving manual lymphatic drainage (MLD).	To examine the long-term preventive effects, up to 5 years after surgery, of manual lymphatic drainage (MLD) in addition to lymphedema prevention information.	The study found insufficient evidence to support or refute the preventive efficacy of MLD in preventing lymphedema, suggesting that exercise and education alone may be equally effective.
Odynets T, et al.	2019	n=68. Women between 50-60 years old	2 groups. Group 1 (aquatic exercise) n=34. Group 2 (exercise, Pilates method) n=34	Post-radical mastectomy patients were enrolled in a 3-month outpatient rehabilitation program. Joint range of the shoulder, limb circumference, and muscle strength were evaluated.	To compare the effects of two individualized physical interventions on the upper limb after radical mastectomy.	Both physical interventions were beneficial in improving upper limb function after radical mastectomy, with the aquatic exercise group showing significantly better results in shoulder joint range and lymphedema prevention.
Odynets T, et al.	2018	n=115. Women between 50-60 years old	3 groups. Group A (conditional swimming, water and recreational aerobics) n=45. Group B (conditional swimming and Pilates exercises) n=40. Group C (yoga exercises and stretching) n=30	Patients after modified radical mastectomy and adjuvant radiotherapy were enrolled in an individualized physical rehabilitation program. Pain was assessed using the VAS and McGill questionnaires.	To determine the effectiveness of individualized physical rehabilitation programs aimed at reducing post-mastectomy pain syndrome in breast cancer survivors.	The rehabilitation programs were effective in reducing post-mastectomy pain syndrome, with Group A showing better reduction in pain compared to Groups B and C at the 6-month evaluation.
Abdelhalim NM, Samhan AF	2018	n=43. Women between 45-55 years old	2 groups. Group 1 (extracorporeal shockwave therapy) n=21. Group 2 (intermittent pneumatic compression therapy) n=22	Post-mastectomy, lumpectomy, and radiotherapy/chemotherapy patients with unilateral lymphedema were assessed for limb circumference, skinfold thickness, and muscle strength.	To compare the effects of extracorporeal shockwave therapy (OHT) versus intermittent pneumatic compression therapy (IPCT) on lymphedema in women after breast cancer treatment.	OHT was more effective than IPCT in reducing limb circumferences and skinfold thickness, though both groups showed improvement in grip strength with no significant difference between them.
Ammitzboll G, et al.	2018	n=158. Women between 18-75 years old	2 groups. Intervention group (usual care plus progressive resistance	Patients undergoing breast cancer surgery and axillary lymph node dissection were randomly assigned to groups. The intervention began in the second week	To examine the effect of progressive resistance training (PRT) on health-related	Significant improvement in emotional and social aspects in both groups, with a small trend

			program) n=82. Control group (usual care and information) n=76	after surgery. Quality of life was assessed.	quality of life and predefined symptoms such as pain, sleep, and fatigue.	favoring the intervention group in global health status, physical function, and fatigue reduction.
Sweeney FC, et al.	2018	n=100. Women with a mean age of 53.5	2 groups. Group 1 (exercises) n=50. Group 2 (usual care) n=50	Patients who underwent surgery for breast cancer and adjuvant therapies were subjected to supervised, progressive aerobic and resistance exercise 3 times a week for 16 weeks.	To assess the effects of a 16-week aerobic and resistance exercise intervention on shoulder function in overweight or obese women with breast cancer.	The exercise group showed significant improvements in shoulder function and overall functionality compared to the usual care group, which lacked supervised exercise follow-up.
Mariana Tirolli Rett, et al.	2022	n=49. Women with a mean age of 50.61±11.14 years	The sample consisted of women referred to physiotherapy who met the eligibility criteria. There was no control group.	20 individualized physiotherapy consultations (60 minutes, three times a week) included passive mobilizations, stretching, and resistance exercises. Participants received guidance on limb and skin care.	To determine the influence of physiotherapy after breast cancer surgery on improving range of motion and pain over time.	Physiotherapy contributed to significant improvements in range of motion (ROM) and reduction of pain intensity in the homolateral upper limbs. Regular exercise is recommended to maintain gains.
Marco Calapai, et al.	2023	n=126. Women who had a mastectomy during 2021-2022	47% of patients (n=58) were affected by chronic post-mastectomy syndrome (PMP group). 54% (n=68) reported no significant pain (non-PMP group).	A prospective cohort study assessing pain and motor activity at 3 and 6 months post-mastectomy using the Numerical Rating Scale (NRS) and Brief Pain Inventory (BPI). Physical activity was measured using the IPAQ.	To evaluate the effects of physical exercise and motor activity on oxidative stress and inflammation in postmastectomy pain syndrome.	Physical activity was associated with the reduction of chronic post-mastectomy pain syndrome and may serve as a key biomarker for pain management and appropriate therapy in the postmastectomy period.

The role of physiotherapy in oncology is gradually gaining recognition, with different modalities being proposed as a valuable addition to the arsenal of treatments available in the fight against cancer. Despite the absence of a cure, the objective of physiotherapy in cancer is to maintain and enhance the quality of life of individuals diagnosed with this disease, thereby ensuring a normal life expectancy. There are various therapeutic modalities that physiotherapy can offer to patients who have undergone a mastectomy, although the evidence for their efficacy is often disputed. The clinical trial conducted by Devoogdt N, et al. examines the efficacy of manual lymphatic drainage (MLD) as a high-evidence therapeutic modality for the short- and long-term prevention of breast cancer-associated lymphedema in patients who have undergone axillary lymph node dissection. Other studies have reached the conclusion that MDL is effective; however, the follow-up period was limited to approximately six months after surgery and the participants had not undergone axillary lymph node dissection, only a sentinel node process. In contrast, the clinical trial of Devoogdt N, et al. included all participants who had undergone a total axillary lymph node dissection, which is a procedure that increases the risk of

developing lymphedema. Furthermore, follow-up and evaluation were conducted up to 60 months after surgery.

In the various studies on the effectiveness of MLD, different methods have been employed, including Földi, Leduc, and Vodder techniques. It is therefore recommended that future research examine the efficacy of these techniques in preventing the development of lymphedema. In regard to the clinical trial conducted by Abdelhalim NM, Samhan AF delineates two established intervention modalities for the treatment of breast cancer-related lymphedema. The two modalities in question, extracorporeal shock waves and intermittent pneumatic compression therapy, have been demonstrated to have disparate effects. Both modalities demonstrated favorable outcomes in the clinical improvement of patients, as evidenced by reductions in upper limb circumference, increased muscle strength, and enhanced skinfold thickness. These aspects were evaluated in an objective manner at the outset of the intervention, and the initial and final values were compared. Significantly greater improvements were observed in the circumference of the upper limb and skinfold thickness in favor of extracorporeal shock wave therapy. With regard to muscle strength, both interventions resulted in improvement, although no significant values were observed in favor of either.

In regard to the clinical trials conducted by Odynets et al. (2018, 2019), The objective of both studies was to evaluate the efficacy of exercise as a physiotherapeutic modality for the treatment of sequelae, including pain, lymphedema, and decreased functionality in the affected upper extremity, which may result from surgical procedures and adjuvant therapies. The most frequently employed modalities across both studies were aquatic exercises, Pilates, stretching, and yoga. In the clinical trial conducted by Ammitzboll G, et al. and the study carried out by Marco Calapai, et al., which focused on physical activity or exercise appropriate to the needs of each individual, there was an association between the improvement and reduction of the development of pain syndrome after chronic mastectomy. However, it is necessary to verify the exact intensity at the time of application and performance of the exercise in future studies. The reviewed articles present a variety of physiotherapeutic treatment modalities with substantial evidence of efficacy in post-mastectomy cancer patients. However, further research is necessary to ascertain the optimal approach and determine its effectiveness.

4. Conclusión

1. Cancer is one of the most prevalent and lethal diseases globally, with an increasing prevalence that underscores the need for a greater number of professionals with specialized expertise in this field. These professionals must be capable of providing high-quality services to the healthcare system and society at large.
2. A fundamental understanding of the various therapeutic modalities utilized in the management of breast cancer is essential for comprehending the adverse effects these treatments can have on the patient. These effects can manifest in numerous ways, including pain, functional limitations of the shoulder, decreased range of motion, loss of muscle strength, fatigue, and lymphedema.
3. The role of the physiotherapist in the field of oncology is to evaluate and implement physical rehabilitation programs that facilitate the prevention and early care of individuals diagnosed with cancer, with the objective of maintaining and enhancing their quality of life. Furthermore, it is essential to prevent the onset and sudden development of sequelae.
4. The specific modalities or programs of physiotherapy in the hospital and outpatient setting, which have demonstrated the greatest evidence base for use with post-mastectomy cancer patients, are therapeutic exercise, hydrotherapy, and aerobic resistance exercise.
5. The following benefits of physiotherapy in post-mastectomy cancer patients are supported by substantial evidence: a reduction in pain, a decrease in fatigue, an increase in range of motion, an increase in muscle strength, an increase in shoulder functionality, control of lymphedema, and an improvement in quality of life.

The physiotherapeutic methods or modalities employed in the treatment of post-mastectomy cancer patients are numerous, yet the evidence supporting their efficacy remains inconclusive.

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